AMENDMENTS TO THE CLAIMS

1. (Currently Amended) A device comprising:

a piezoelectric resonator;

a pair of electrodes coupled to the piezoelectric resonator; wherein the electrodes have at least one functionalized surface, wherein the functionalized surface is configured to react with target molecules; and

control circuitry configured to apply an excitation signal to the pair of electrodes and to determine a frequency response for the layer of piezoelectric material,

further comprising a second piezoelectric resonator and an additional pair of electrodes having a non-functionalized surface coupled to the second piezoelectric resonator, wherein the control circuitry is configured to apply the excitation signal to the additional pair of electrodes and to determine a frequency response for the second piezoelectric resonator.

2. (Canceled).

3. (Canceled)

4. (Currently Amended) The device of claim [[3]] 1, wherein the piezoelectric resonators comprise film bulk acoustic resonators (FBARs).

5. (Previously Presented) The device of claim 1, wherein the excitation signal comprises an in-phase signal.

6. (Previously Presented) The device of claim 1, wherein the excitation signal comprises an out-of-phase signal.

7. (Previously Presented) The device of claim 1, wherein the excitation signal comprises a single frequency signal.

8. (Previously Presented) The device of claim 1, wherein the excitation signal comprises a mixed frequency signal.

9. (Previously Presented) The device of claim 1, wherein the excitation signal comprises a time-variant signal.

10. (Original) The device of claim 1, wherein the functionalized surface comprises one or more biomolecules configured to bind with the target molecules.

11. (Original) The device of claim 10, wherein the biomolecules comprise biologically active molecules.

12. (Original) The device of claim 10, wherein the biomolecules comprise biologically derivatized molecules.

13. (Original) The device of claim 1, wherein the functionalized surface is functionalized by immobilization of biomolecules on a self-assembly monolayer.

14. (Original) The device of claim 1, wherein the functionalized surface is functionalized by immobilization of biomolecules on an organic membrane.

15. (Original) The device of claim 14, wherein the organic membrane is pre-coated onto the functionalized surface.

16. (Original) The device of claim 14, wherein the organic membrane is chemically derivatized on the functionalized surface.

17. (Original) The device of claim 16, wherein the organic membrane is chemically derivatized on the functionalized surface by silylation.

18. (Original) The device of claim 16, wherein the organic membrane is chemically derivatized on the functionalized surface by acylation.

19. (Original) The device of claim 16, wherein the organic membrane is chemically derivatized on the functionalized surface by esterification.

20. (Original) The device of claim 16, wherein the organic membrane is chemically derivatized on the functionalized surface by alkylation.

21. (Original) The device of claim 1, wherein the functionalized surface is functionalized by direct immobilization of biomolecules on metal.

22. (Original) The device of claim 1, wherein the functionalized surface is functionalized by direct immobilization of biomolecules on a non-metallic inorganic film.

23. (Original) The device of claim 1, wherein the functionalized surface is functionalized by self-assembling biomolecular layers on the functionalized surface.

24. (Original) The device of claim 23, wherein the assembling biomolecular layers comprise amino acid derivatized fatty acids or lipids.

25. (Withdrawn) A system comprising:

a layer of piezoelectric material, wherein the layer of piezoelectric material has at least one surface that is functionalized to bind with target molecules a pair of electrodes coupled to the layer of piezoelectric material

control circuitry configured to apply an excitation signal to the pair of electrodes and to determine a frequency response for the layer of piezoelectric material

26. (Withdrawn) A system comprising:

a pair of film bulk acoustic resonators (FBARs), including a test FBAR and a reference FBAR, wherein each FBAR includes

a layer of piezoelectric material

a pair of electrodes coupled to opposite sides of the layer of piezoelectric material;

wherein an exposed surface of one of the electrodes of the test FBAR is functionalized with biomolecules;

further comprising control circuitry coupled to the pair of FBARs and configured to determine frequency responses for the test FBAR and reference FBAR.

27. (Withdrawn) A method for detecting target molecules comprising:

providing a first piezoelectric resonator sandwiched between a pair of first electrodes, wherein the first electrodes have a first surface functionalized with a first type of biomolecules, wherein the presence of target molecules causes the first type of biomolecules to change the frequency response of the first resonator;

exposing the first surface of the first electrodes to a test fluid;

determining a frequency response of the first resonator after the first surface has been exposed to the test fluid; and

determining, based upon the frequency response of the first resonator, whether the test fluid contained target molecules.

28. (Withdrawn) The method of claim 27, further comprising:

providing a second resonator sandwiched between a pair of second electrodes, wherein the second electrodes have a second surface that is not functionalized with the first type of biomolecules;

exposing the second surface of the second electrodes to the test fluid;

determining a frequency response of the second resonator after the second surface has been exposed to the test fluid; and

wherein determining, based upon the frequency response of the first resonator, whether the test fluid contained target molecules.

29. (Withdrawn) The method of claim 28, further comprising, after exposing the first surface of the first electrodes and the second surface of the second electrodes to the test fluid, removing at least a portion of the test fluid from the first surface of the first electrodes and the

second surface of the second electrodes before determining the frequency responses of the first and second resonators.

30. (Withdrawn) The method of claim 28, further comprising, after exposing the first surface of the first electrodes and the second surface of the second electrodes to the test fluid, removing substantially all of the test fluid from the first surface of the first electrodes and the second surface of the second electrodes before determining the frequency responses of the first and second resonators.